BRIEF REPORTS

Effect of the mandatory helmet law in Taiwan

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Abstract

***Objective*—To estimate the impact of a mandatory motorcycle helmet law in Taiwan.**

***Methods*—Taiwan passed a mandatory helmet law in June 1997. Data were collected retrospectively from police reports, which include hospital data, to compare six months pre-law (June to November 1996) with the same six months post-law (June to November 1997).**

***Results*—Motorcycle fatalities decreased 14% after the introduction of the helmet law. Head injury fatalities fell 22% while fatalities from injuries to other bodily areas rose 20%. Non-fatal motorcycle injuries fell 31%. Non-fatal head injuries fell 44%; non-fatal injuries to other body parts fell 23%.**

***Conclusion*—This study indicates that large, immediate public health benefits resulted from the mandatory motorcycle helmet law in Taiwan.**

(*Injury Prevention* 1999;**5**:290–291)

Keywords: motorcycle; head injury; helmet law

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Taiwan has one of the highest motorcycle use rates in the world; there are 11 million motorcycles in a total population of 22 million people. Motorcycles account for 74% of all motor vehicles, and for almost half of all motor vehicle related deaths (the denominator includes pedestrian fatalities).[1] By contrast, in the United States, motorcycles account for fewer than 2% of all motor vehicles and 8% of all motor vehicle related deaths.[2]

Motorcycles are also a principal cause of non-fatal injuries in Taiwan. For example, traffic injuries account for 69% of all cases of traumatic brain injury and motorcycle injuries account for 64% of traffic related cases of traumatic brain injury.[3]

In the mid-1990s, Taiwan was one of the few Asian countries without a helmet use law. In January 1994, a six month pilot program—a helmet use persuasion policy—was adopted by the police in one jurisdiction, Taipei City. The program led to an increase in helmet use rates in that city, from 21% in January 1994 to 79% in May 1994.[3] A comparison of Taipei City injury rates from July 1993 to December 1993 with injury rates from January 1994 to June 1994 showed a decline in motorcycle fatalities by 40% and a reduction in motorcycle head injury hospitalization by 30%.[3] The pilot program ended in June 1994.

Three years later, on 1 June 1997, after much legislative debate, mandatory helmet use for motorcyclists became the national law in Taiwan.

The law dramatically increased helmet use. Island-wide observations were undertaken at fixed intersections in each of three cities, representing northern, central, and southern Taiwan (Taipei City, Taichung City, and Tainan) in 1997, between 5 pm and 7 pm on various days of the week. Over 22 000 cyclists were observed in March, April, and May before the law, and over 15 000 cyclists were observed in July, after the law. Results indicate that the percentage of helmet use among motorcycle riders in these three areas increased from 30% to 98% after the law was introduced.[4]

The law did not reduce the number of licensed cyclists. Nationwide, the number of licensed cyclists increased from 8.7 million in 1996 to 9.1 million in 1997 to 9.7 million in 1998.

The present study attempts to estimate the impact of the law on fatal and non-fatal injuries to cyclists.

Methods

Simple counts were made of nationwide fatalities from June to November 1996 (pre-law) compared with the same six month period June to November 1997 (post-law), the first six months after the law was enacted. Data come from police accident reports collected by the Department of Transportation. Regions report to a central national agency—national police headquarters—under a clear protocol of how the data are to be collected, using information supplied in part by acute care heath professionals. Fatality data include only motorists who died from their injuries within 24 hours of the crash. Fatalities are thus undercounted for both time periods.

The data provided by the hospital includes information on whether the cyclist died, and on the principal body part injured. For this study, a non-fatal injury is defined as an injury resulting in hospitalization, with the patient surviving at least 24 hours after the crash. Cyclists whose injuries did not result in a

Table 1 Motorcycle deaths and hospitalized injuries in Taiwan, by anatomical region of the most severe injury, before and after the mandatory helmet law. June to November, 1996 (pre-law) compared with June to November 1997 (post-law)

	Fatal			*Non-fatal*		
	Pre-law	*Post-law*	*% Change*	*Pre-law*	*Post-law*	*% Change*
Head	581	450	−22	284	166	−44
Other	151	181	+20	331	256	−23
Total	732	631	−14	615	422	−31

Source: Vital statistics, Department of Health, Taiwan ROC, 1999; *Statistics Report*, Ministry of Transportation and Communication, 1999.

hospitalization—including those who died at the scene—are not included in the non-fatal data.

For both fatal and non-fatal (hospitalized), we classified the injuries by the anatomical region that was most severely injured, and divided the regions into two categories: the head and all other body parts. Fisher's exact test was used to compare the reductions in head injuries with the changes in injuries to other parts of the body in the two time periods.

Data were available on whether the injured cyclist was wearing a helmet. However, no reliable information was available on the number of motorcycle miles driven in Taiwan, or the actual number of crashes involving motorcycles.

Results

Motorcycle fatalities decreased 14% after the introduction of the helmet law (table 1). Fatalities caused by head injuries fell 22%, while fatalities due to injuries to other parts of the body rose 20% ($p<0.01$). Non-fatal motorcycle injuries fell 31% after the introduction of the law. Non-fatal injuries, where the head was the most seriously injured body part, fell 44%; non-fatal injuries where other parts of the body were the most seriously injured fell 23%. The difference between the changes in non-fatal head injuries and injuries to other parts of the body was statistically significant ($p<0.05$).

For fatalities, in the pre-law period, of those wearing a helmet 57% died of head injuries; of those not wearing a helmet, 81% died of head injuries. These percentages were not significantly different in the post-law period, although overall, more of the fatalities were wearing a helmet. For non-fatally injured cyclists in the pre-law period, of those wearing a helmet 28% had the most severe injury to the head; of those not wearing a helmet, 49% had the most severe injuries to the head. These percentages were not significantly different in the post-law period.

Discussion

Our results point to the immediate effectiveness of the helmet law in Taiwan. Head injuries are the principal cause of motorcycle deaths, and as expected, the law substantially reduced both fatal and non-fatal head injuries. The reductions in head injuries were significantly greater than those for injuries to other parts of the body.

Deaths due to injuries to other parts of the body increased somewhat after the helmet law. This finding may be somewhat of a statistical artifact rather than representing a real increase in the severity of injury to other bodily parts. We classified deaths by the anatomical region most severely injured. In some serious crashes, an unhelmeted cyclist might have died from internal injuries as well as trauma to the head, but the head was most severely injured. In other words, if the head were protected, the individual would still have died, but the death would be attributed to injuries to other parts of the body. Helmets might be expected to reduce head fatalities, and overall fatalities, but might increase fatalities attributable to injuries to other anatomical regions.

The protection to the head from wearing helmets is also suggested by both the pre-law and post-law data which indicate that, among injured cyclists, those wearing a helmet were significantly less likely than those without a helmet to have their most serious injury be to the head.

Our results are consistent with prior studies in the United States that found that helmets are effective safety devices, and that mandatory helmet laws reduce injuries.[5–10] One reason for the effectiveness of mandatory helmet laws is that they are easily enforced because noncompliance is readily observable.

The law in Taiwan is in some sense more important than similar laws in many other countries. That is because of the role of the motorcycle in Taiwanese life. It is estimated that, on an average day in Taiwan, over 40% of the total population rides a motorcycle.[4] In a nationwide survey in 1998, 56% of motorcycle owners stated that the motorcycle was their primary mode for commuting to work or school.[11]

Reliable data were not available to hold constant any changes in motorcycle mileage or motorcycle crashes between 1996 and 1997. None the less, the motorcycle helmet law in Taiwan, as in the United States, appears to be a highly successful public health policy.

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